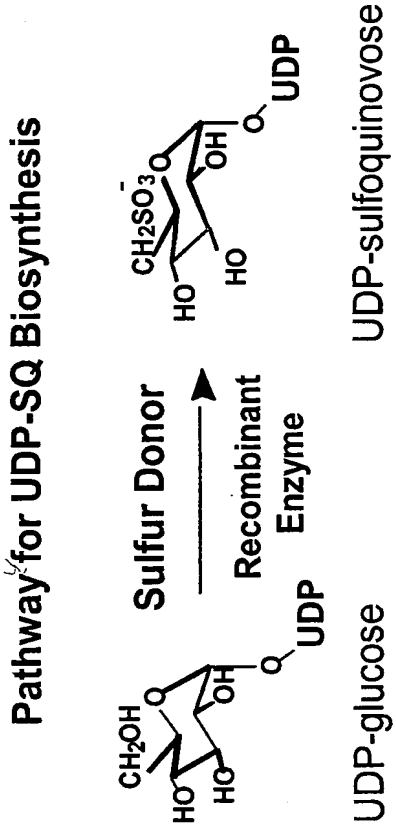


FIG. 1

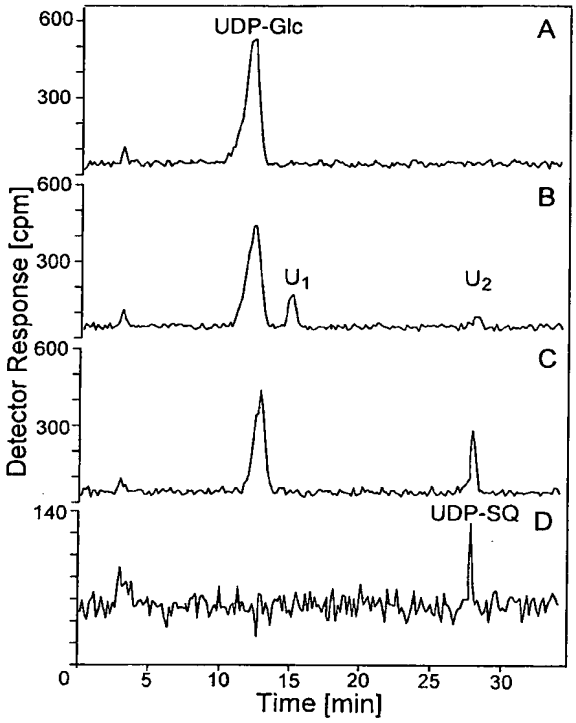

600
300
UDP-Glc
A
600
300
B
U1
U2
600
300
C
140
UDP-SQ
D
Detector Response [cpm]
0
5
10
15
20
25
30
Time [min]

FIG. 2

pQE-30, pQE-31, AND pQE-32 VECTORS

POSITIONS OF ELEMENTS IN BASES	**pQE-30**	**pQE-31**	**pQE-32**
VECTOR SIZE (bp)	3462	3464	3463
START OF NUMBERING AT *Xho*I (CTCGAG)	1-6	1-6	1-6
T5 PROMOTER/lac OPERATOR ELEMENT	7-87	7-87	7-87
T5 TRANSCRIPTION START	61	61	61
6xHis-TAG CODING SEQUENCE	127-144	127-144	127-144
MULTIPLE CLONING SITE	145-192	147-194	146-193
LAMBDA t_0 TRANSCRIPTIONAL TERMINATION REGION	208-302	210-304	209-303
rrnB T1 TRANSCRIPTIONAL TERMINATION REGION	1064-1162	1066-1164	1065-1163
ColE1 ORIGIN OF REPLICATION	1639	1641	1640
β-LACTAMASE CODING SEQUENCE	3257-2397	3259-2399	3258-2398

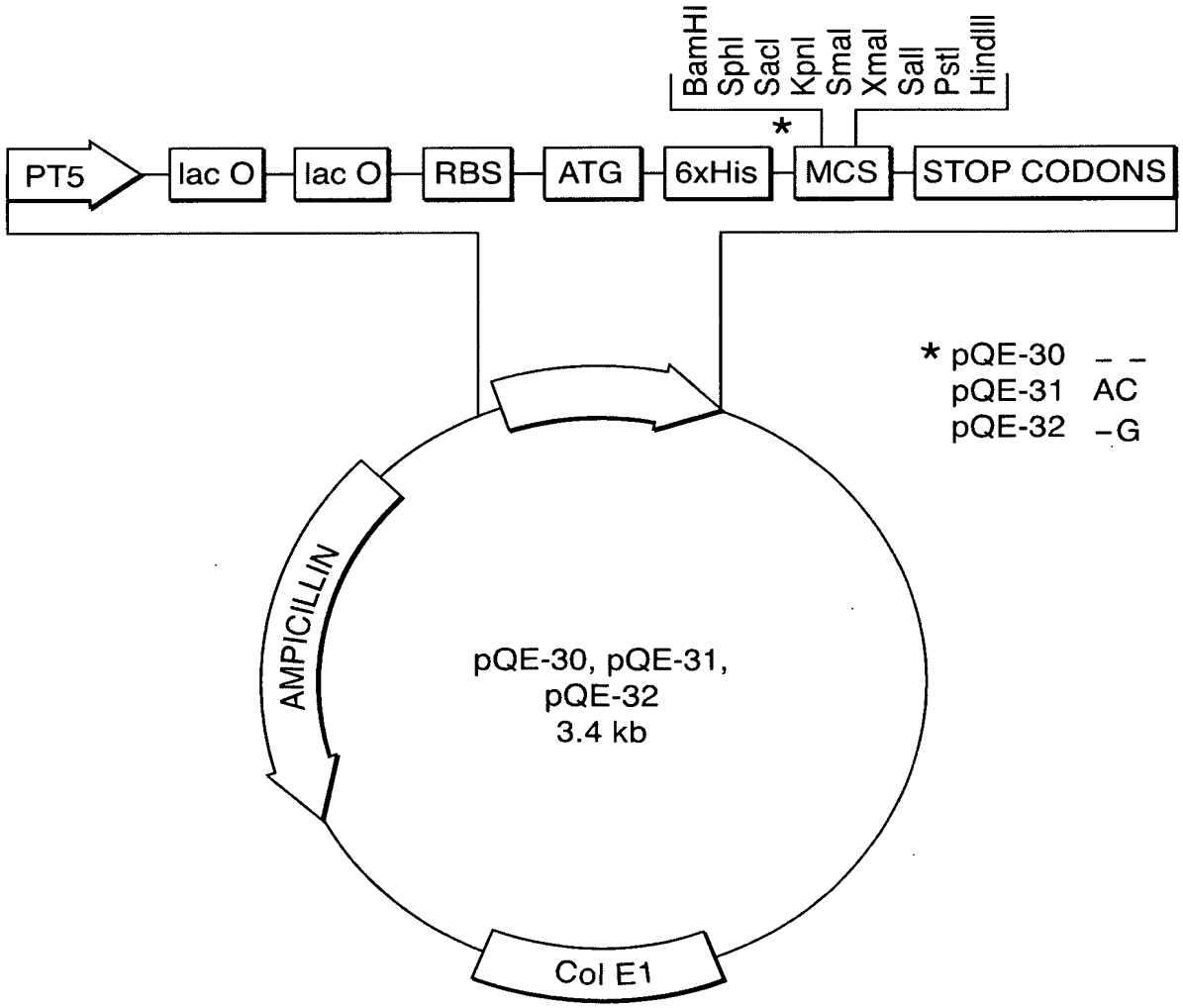
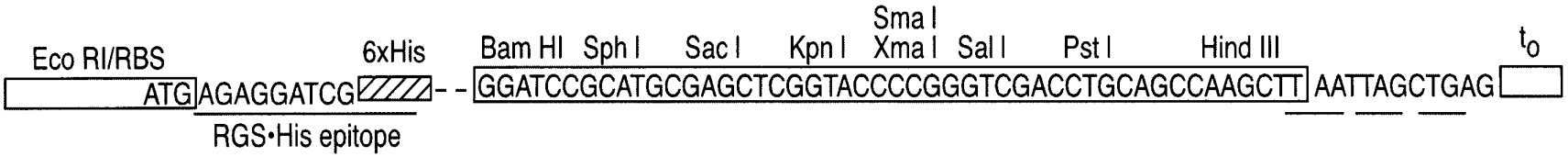


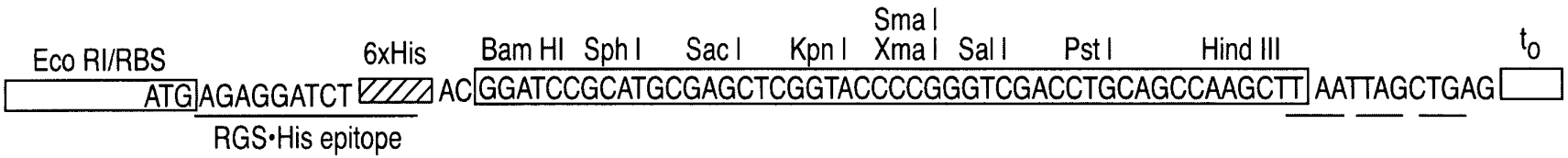
FIG. 3

pQE-30



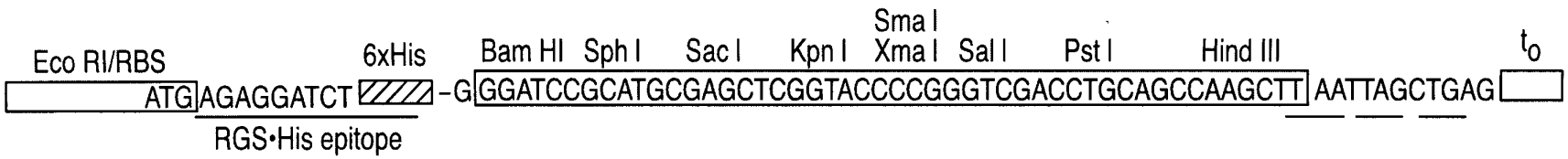
(SEQ ID NO:22)

pQE-31



(SEQ ID NO:23)

pQE-32



(SEQ ID NO:24)

FIG. 3 CONTINUED

Appln No.: 09/709,020 Filed: 11/08/00
Inventors: Handique *et al.*
Attorney Docket No.: MSU-04769
Reply Dated Nov. 9, 2006
Notice Regarding Drawings Dated 10/05/06
Replacement Sheet Sheet 4 of 23

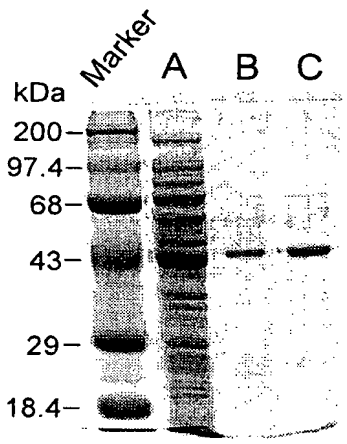


FIG. 4

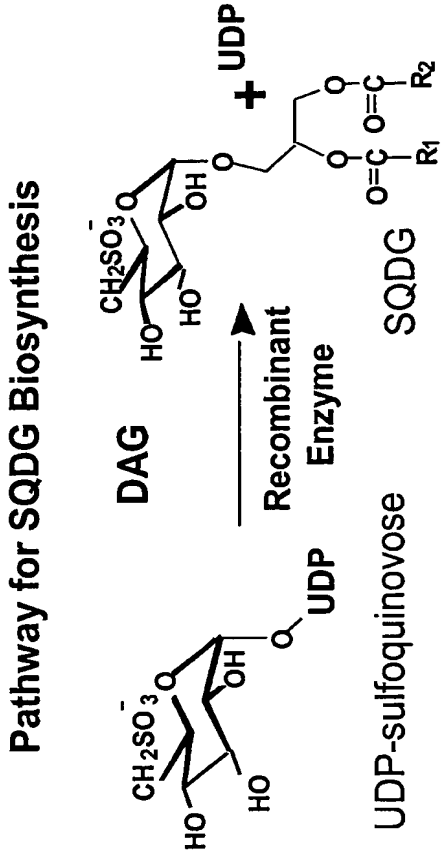

Pathway for SQDG Biosynthesis
UDP-sulfoquinovose
UDP
DAG
Recombinant Enzyme
SQDG
UDP

FIG. 5

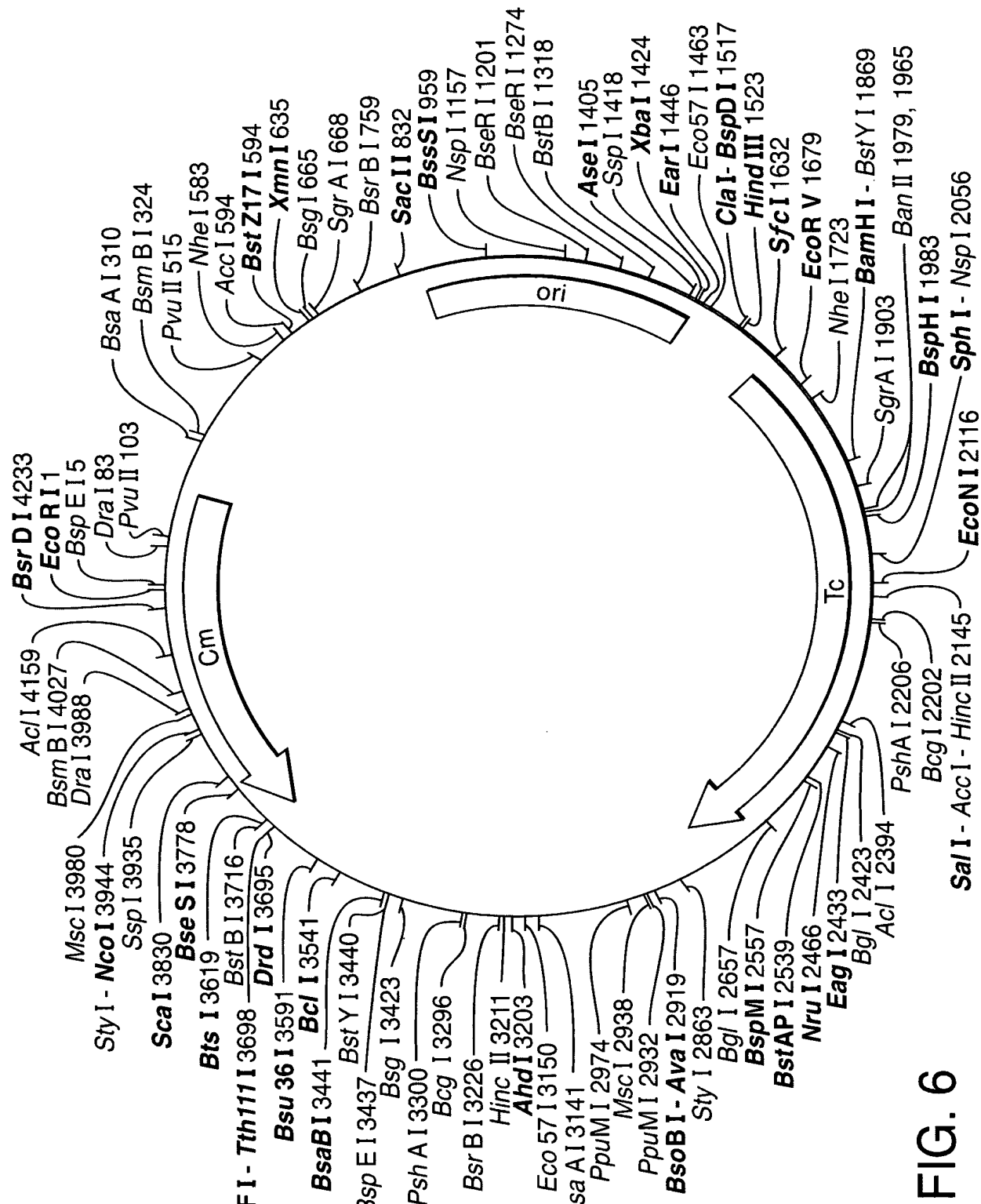

Cm
ori
Tc
Bsa A I 310
Bsm B I 324
Pvu II 515
Nhe I 583
Acc I 594
Bst Z17 I 594
Xmn I 635
Bsg I 665
Sgr A I 668
Bsr B I 759
Sac II 832
BssS I 959
Nsp I 1157
BseR I 1201
BseR I 1274
BstB I 1318
Ase I 1405
Ssp I 1418
Xba I 1424
Ear I 1446
Eco57 I 1463
Cla I - BspD I 1517
Hind III 1523
Sfc I 1632
Eco R V 1679
Nhe I 1723
BamH I - BstY I 1869
Sgr A I 1903
Ban II 1979, 1965
BspH I 1983
Sph I - Nsp I 2056
Eco N I 2116
Sal I - Acc I - Hinc II 2145
Acl I 2206
Bcg I 2202
PshA I 2206
Acl I 2394
Bgl I 2423
Eag I 2433
Nru I 2466
BstAP I 2539
BspM I 2557
Bgl I 2657
Sty I 2863
BsoB I - Ava I 2919
PpuM I 2932
Msc I 2938
PpuM I 2974
Bsa A I 3141
Eco 57 I 3150
Ahd I 3203
Hinc II 3211
Bsr B I 3226
Bcg I 3296
Psh A I 3300
Bsg I 3423
Bsp E I 3437
Bst Y I 3440
BsaB I 3441
Bcl I 3541
Bsu 36 I 3591
Drd I 3695
Pfl F I - Tth111 I 3698
Bst B I 3716
Bts I 3619
Bse S I 3778
Sca I 3830
Ssp I 3935
Sty I - Nco I 3944
Msc I 3980
Dra I 3988
Bsm B I 4027
Acl I 4159
Bsr D I 4233
Eco R I 1
Bsp E I 5
Dra I 83
Pvu II 103

FIG. 6

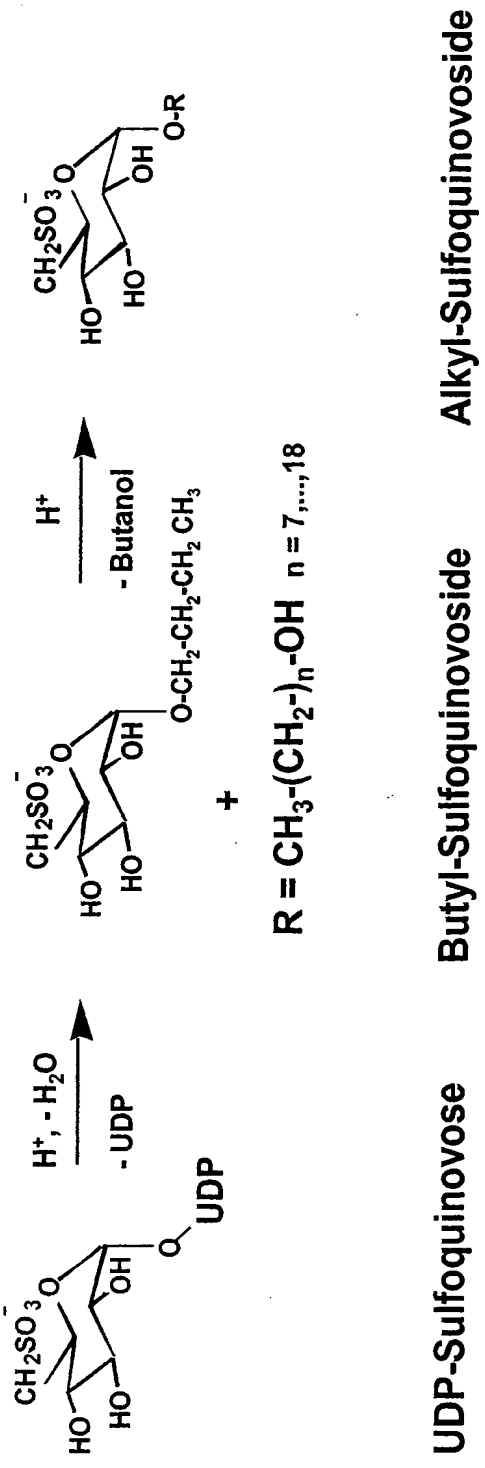

UDP
H+, - H2O
- UDP
UDP-Sulfoquinovose
+
R = CH3-(CH2-)n-OH n = 7,...,18
O-CH2-CH2-CH2 CH3
H+
- Butanol
Butyl-Sulfoquinovoside
O-R
Alkyl-Sulfoquinovoside

FIG. 7

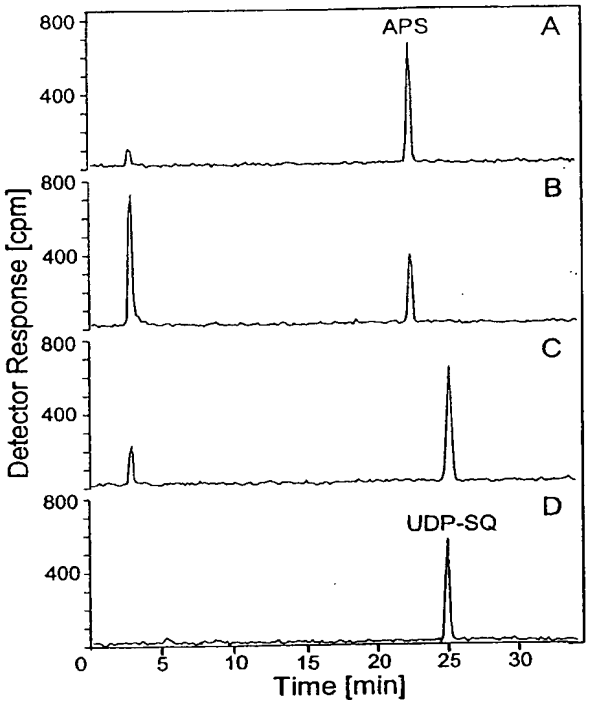

APS
A
B
C
D
UDP-SQ
800
400
Detector Response [cpm]
0
5
10
15
20
25
30
Time [min]

FIG. 8

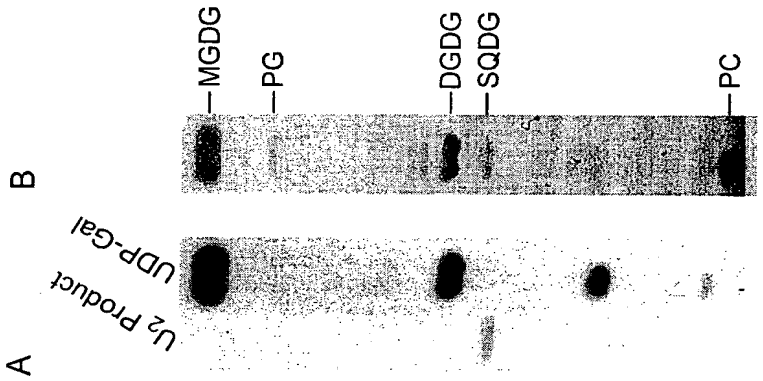


FIG. 9

SQDX

1	a
2-61	tgcgcatcgc tctctttacc gagacgttcc tccccaaagt ggatggcatc gtcacgcggc
62-121	ttcggcacac ggtcgatcac ctgcagcgtc ttggccacac cgtcatggtt ttttgccccg
122-181	acggcgggct ccgcgagcac aaggggggctc gagtctatgg ggttaaaggc tttccgctac
182-241	cgctctatcc cgagctgaag ctagcttttc cgttgccgaa agtgggaaaa gccttggagc
242-301	ggttccggcc cgacctgatc cacgtggtca atccggctgt gttggggttg ggcggcatct
302-361	actatgccaa ggcgctaaat gtgccactcg tggcgtccta tcacacccat ttgccgaaat
362-421	accttgagca ttacgggctg ggggtcttgg agggggtgct ctgggaattg ctgaagctgg
422-481	cgcataacca agcagcgatc aacctctgta cttcaaccgc gatggtgcag gagctgacag
482-541	atcacggcat tgagcactgt tgcctctggc agcgaggagt ggataccgag acctttcggc
542-601	cagacttggc tactgctgcg atgcgcgatc gcctcagtgg cggtaagccc actgcgccct
602-661	tgttgctcta cgtcggacgc ctctcagccg agaagcaaat cgatcgcctg cgacccattt
662-721	tggatgccaa tcctgaggct tgcttggcct tggtcggcga tggcccgcat cgggccgaac
722-781	tagagcaatt gtttgctggc acccagacgc agttcattgg ctatctgcat ggggaacagc
782-841	taggggcggc ctacgcttct gctgacgctt ttgtctttcc ctcccggacc gaaaccctcg
842-901	gtctagtctt gctggaagcc atggcagcgg gttgtccggt cgtggcggcc aattccggtg
902-961	gcattcccga tattgtcagc gacggcatta atggtttcct gttcgatcct gaggatgaac
962-1021	aaggggcgat cgctgcgatt cagcgcttgt tggctaaccc tgcagagcgc gagattctac
1022-1081	gccaagcggc tcgtcaagaa gccgaacgct ggagctggaa cgcagccacg cgccaactcc
1082-1134	aggactacta ctgcgaggtg ttggcagatg gttgcttacc cttagcggcc tga

FIG. 10

Appln No.: 09/709,020 Filed: 11/08/00
Inventors: Handique *et al.*
Attorney Docket No.: MSU-04769
Reply Dated Nov. 9, 2006
Notice Regarding Drawings Dated 10/05/06
Replacement Sheet Sheet 11 of 23

AtSQDX-1

```
  1-57       ctacacg ttaccttccg gtactggaaa cagtcgttta atcaaccaat tgattggtcc
 58-117   caaaacatga actttctttt tcctccagaa ccaaatcgct gcactgtact gttcattgcg
118-177   tatctttgtc gttgctgctc tccaatcata tttctcggtc tcttctcttg ccgcttttcc
178-237   aatgatctct cttgtttcac ggtcgtgcag taaagttctc agttttgtca cgcaatcttc
238-297   aacatctcca gggttgaaca aaaatccggt ttttccctcc tgatgaaaac atcagaatca
298-357   gaaaaccaca agctcaatat aggttgaccc ataagaacaa tcaatgcaag atcattttgt
358-417   gtaccagtct atgattgaat aaagtttcag ttcggttaca gctcgcttat aagaaaattg
418-477   gcagaaattg ttttttcaac catttcggtt cggttgatat gctcatcaat atggtttggc
478-537   agttaattgt aattcagata attcactgac ctgatcttca gggattatat cagggattcc
538-597   accggcacgg gccgcgacga caggaagtcc tgaagacatt gcttcaagaa ccacaaggcc
598-657   aagtgtctcc gactctgatg gcatcacaaa cacatctcca cttgcgtaag cttgtgagag
658-717   ttcatcgcct tgtaacgttc cagtgaaaac cgctggcatt ccggtaaaca acttctcaag
718-777   atcctctctt taagaaaacg aaacagataa acaaaattac aatgttgttg actagaaatc
778-837   ttcagataac aatatggcca atctttaaca aaactagtac ttgtatggtc catctccaat
838-897   gaaagcaatc cgagcttcag gtaatttgtc cattacactg cacacaaatt tctcaatatc
898-957   aaaattcgat acaccactta aaagaagtga gtccagttta tacaaaattc taacctcttt
958-1017  aaaagctcca aactcttttc tacgccaatg cgacctacat gaatcactag tggcttttct
1018-1077 ggttcgccat tactgttaat tacaaaatat taaacatcaa gattagcgtg gaaagtatca
1078-1137 ttgtttttaa tgcatataaa agaaacgtat attctattct tgcctcagtc ttatacgcat
1138-1197 ttcttgagaa cggaaacggg gattgaagct ttctgaatcg acacccttat tccaaagtcg
1198-1257 aagttgatta gcttcaatat atgaaaaaaa gaagaagaaa atgtaagttt tgaacaatca
1258-1317 tagagcttgt acaaaaatgt aatgtatgat ctttcttcac ctgcagttgc accagctgct
1318-1377 ataagatctt ttccaatggc agcagaagga actaatgtaa gatcagccgc tctgtgaagg
1378-1437 aaccctgata aaagcatatt caagtttagt ttcatattat acatcacaat aaaccagaaa
```

FIG. 11

```
1438-1497  aagaagaagg aaattttgac atttgaaaag cgggttttac atacttatta tagaccacat
1498-1557  tggttttacc aaccaactaa aagtgtatct tgggatgtat ctgcacatca acacaagctt
1558-1617  aatcttagac aaaaattttt ttataacaac attgtgaaat gaggcagaaa aaggtactta
1618-1677  cacagggacg tgtgtgtggt aagacattac tattggtaca gatagcattt ttgctattgc
1678-1737  cagagcacca aagacctaaa aattttagtc agggaaaaaa gagagtcaag ttctggattc
1738-1797  tctccagttc actggtcttg ctaatgtttt agtaatgtga attcttgagg gatttaccat
1798-1857  aactccggga gatgaagcgt gtataatgtc aggcttaaac cgtgcaattt cagagatgat
1858-1917  tcttggacta agcgcaagcg agagtggaac cttttggtaa taaggacaag ggaagctaca
1918-1977  gaagagaaga agaaattagc gatattacca aatagagaac atccagtgag taaactaaat
1978-2037  ggtgctacct tcttgatcca atgactctgg ctccataaaa ctcttcagga acaccttcat
2038-2097  gtgtcgtcac gactataacc tatgaagcaa aaaagttatt aaaaaaaaaa aaaaaggaac
2098-2157  agttaacact tgtcaagtaa ttctaattct ggaaacagtt acttatgagc tgactgaaaa
2158-2217  gatacttaag ttgaagaatg agatagtaaa agaagaaacc tcgtctccca tttcacggag
2218-2277  gtatctaatg aaattctgga atctgttttt gtagccggat acatagctgc aacaaaatca
2278-2337  aagagagaat cacttccaat aataacatga catataataa aagcttttgg tcaatggatc
2338-2397  ggtgattccg agaatcttgg gatattcaca actaaaatct gacaactttg actcaaacaa
2398-2457  atcctgaatg taattggttt taacgatcta ctatataatt tgctaaattg gtggtgtagc
2458-2517  aaattcatac attagcgagt atctcttcat aaaataaatg taacgatcaa atcgaaagaa
2518-2577  aaaaacatta caggaaaaag tcaaccaagg aaaaaaatga gtagaatctg ttttcacaga
2578-2637  gacatttcgt cgaacacaaa acaagcaaaa aaagaacact gtgaagaaga cttacgcaaa
2638-2697  gggagaaggc tcaacaaaga gagcaattct cctaggctta gagagcgact caggatcgag
2698-2757  aagcggcgca tcaatctccg attcgtcatc ttctctgact tgagtaatag tcatatcgtt
2758-2817  ggacccagaa acagcttcct ttgtaatcac tccacagaag cggagcttgc ttttcttgct
2818-2877  aatgggtaat ctccggtgac caaacgaaag aggggaatga agaacaaaag aagaagacct
2878-2937  gggaggagaa caagaggttg cagaggaaga agaacaagtg ttagtcgtgc taggaagcaa
2938-2979  atgaggaggt atagagagat ttatagaaga aagagtcgtc at
```

FIG. 11 CONTINUED

AtSQDX-2

```
    1-50                tcatattttg aaaaagcact tcttcttctt cttcttcttc ttcttcttct
   51-110   tcttcttccc atcaaaaagt gctagtggca agaccgcgca tattccagta acaaagttta
  111-170   aattcaaaac tatggaacac aatttgtccc atgttttgtt gcctgaatta aacgaccata
  171-230   tcacttggtt cggccacttc atctcggata cgcacaagcg gttgtcaagg ttgtaaaaga
  231-290   cgattttgta aggatctaca ttggcaaagg gagctttaca gacgacttga aaagtttcgg
  291-350   tgtgaagatt gaaaggtaaa actttggttt ctttgcactc ggtgaaccaa taaagcgacc
  351-410   catctagata cacaggtgcg gggtaagcag caatccgata aggagcagcg agagtgacat
  411-470   acctccaagc attggtacta aagtcgaaaa cttcgcatgt agtagcgttt tttaggccta
  471-530   tttctgcaga gttgtataac caaacgggct tgtatgtgcc cctgaatttg tctttaccga
  531-590   atccaagcat aaagaatttg cgtttaagct tgtagtaacc atctcgtaag tcgatcatga
  591-650   gtttttgata atcgcaaaga ggaagaggcc gataccatct agtggtcggg ttgaccacat
  651-710   aaccggattt gtcgtgattg taaagacaaa cgagaccgtc acaactacta tgtgaaacta
  711-770   agtacagtac gttatccttc tcccaaggag tagggatctt gaacgttgat gatgaaccca
  771-830   actgcaatgt tcttaaagat tctatggtcg ggtttataac atggtgagga aatacagaca
  831-890   ccatcagaac atctggatct cctgattgct gacgatgttt caactaaaat tgtatacatt
  891-950   tttattttat taaaaagata aatatcattt tgttggaatt ggaaaacaaa atctaaaaga
  951-1010  taactttaga tatgtaaggg tcgcatatgt atttgattac attgctatga gtatatgact
 1011-1070  cacttttcca ataatgaaaa aaataaagat gttgagtctt actaattaag ggtaaataca
 1071-1130  aaatttctga tcattaatac aaagaaaaag cctctcataa gccaaagcca ttttactcgc
 1131-1190  cgtaaacatc tccgcagcat actctttaca cttccttcct ctctccgcca atctctccgc
 1191-1250  tccttcagcc acagcaacct ccataaccgc cgtcaaagct tccacatttg gcgcaaacat
 1251-1310  aaacccaaac tcatcattca ccactatagt cctctttatg cttgcgtacc tagatgccat
 1311-1370  cactggttta ccactcaaca tcgcttccat taacgttaaa tcaagacctt gtggtctaag
 1371-1430  cgttggattc acgaacaaat cgatcccgtt gtagaaaccc ttgagctcat ttgggtttag
 1431-1490  agatcccaaa atggaaactt tttcccctaa ttccttgtaa cgttgctccc atggccctga
```

FIG. 12

```
1491-1550  tccagctact acgaggtaaa catttgaata cgtttggatt attttcgcga aagcttcgaa
1551-1610  gagcaatgga tgtcctttgt ctttgactaa tctcccagca gctcctaaaa caatcgctga
1611-1670  tgagttttct ggtaacccta attttgacct aaacagagta cgtagcttct tgtctgatgt
1671-1730  gaatccgttc tcgtcgactc cattgaggat cacatgaacc cttttctcag ggatttggta
1731-1790  aacgtctctt agcatttctc cgcagctatc gctgatagcg atgtggtgag cgtagttgtg
1791-1850  gaagaatctg atttcgtcca gtatcttggg aagcacggca ccgtatagac ttgcattgaa
1851-1910  gccttgtgat cttggttcgt ctggtttacg gatcaggtct tggtaaatac ttgattgtaa
1911-1970  gctctctaac gcaatgccgt gccaggatac agcgaggttt ggaacctccc gggcgatcca
1971-2030  gtgaggtaaa gcaacacttt cagagtgaac cgcatcgaaa ggttctttct tgttttcttc
2031-2090  ttggtaaagc tcccatgcct tgttgtaccg ccattttccg ggctccgcgt cgccgtgaga
2091-2150  atggattata gggtaaatga tttggtcgga aacaggggggg attttgttgg tttcagggga
2151-2210  ttggtctaag ggagaggtga aaacgtggac acggtgtcca cggcgagcta aggcggtgta
2211-2270  tagagtgaag gcgtggcgtt ccatgccgcc aggattggga cccgtgggcc atttccggga
2271-2330  gaaaacagcg agttttagtg ttttgggagg agggttggtt aaggagaaat caaggcggtt
2331-2390  ccaggcaaat tgggcggttt ggaggtcgcc agaccacggt ggctggtttg tgtcagagga
2391-2450  ggaggaggag actgcagcgg tggaggagga gcaagtggag gtgcggagga gaaagagagc
2451-2510  cggtatggta aagaggacgg tgaagaagag gaaagtacaa aggctaaaat gagaattagg
2511-2537  tttcttgagt ttggtttgtg aagccat
```

FIG. 12 CONTINUED

AtSQDX-3

1-7	ttaaggt
8-67	ctcatgcatt tgaccagaac atcgacgaat cgcttgtaca tatgttgctt catgtacatt
68-127	ttctcaacca ttttgcgtcc ttcactcccc aatcgtagcc tctcgtctgg attcctaagt
128-187	agatacaaga gattatgagc taattctttg ttaccggatc tccccattga gtgaagtaga
188-247	ccagtcatgt tgtgttgaac catctctttg gttcctcctg catctgttcc caccactgca
248-307	agtccataag ccattgcttc gattgtcact ctaccaaatg tttcaccaac tccctgtaaa
308-367	aaatcaaggt tcaaaataaa taaaccgaac aaaatcgaaa tggtcaaacc gaaatcaaaa
368-427	cctacatttt gaacaaaaac aaaactgaaa tgttttatcc aaaaccaaac tgaaatcaat
428-487	cacaaattgg tttatttgat tcagtaattc aagttcctat aaaactgata aaactaaacc
488-547	aaaacctaac tgtaaactac tttctagtgg aaaactgcat atgcatcaaa taatgttttt
548-607	gaggtgtgag gaggattacc tgggagtttg taacgtagac atctgctgca gagtataatg
608-667	aagcaacacg ggttgttgca ggagtccaca ttaccgactt agataagttt ccgctgtttg
668-727	acaagaagct taacatctct ttaacgtatc caactttgtt gctctttgaa cccacggatc
728-787	ctaaaagaac tttaagttct tgcttctctc ttcttaagcc attgtcaagt gtgagagaaa
788-847	cacttttcat ctgtcgtgat gaacctctta aacgatgttt gctggagaga ctaacctttt
848-907	ctttcctaat gatccccttg tgattccttt gagattcttg tcctctctca gaaagagcca
908-967	aggcaataga ttcaaggaga agaagttgtc cctttgttgg gtttatgctg ctaagagaca
968-1027	tcacaagcat atctgaatct gttattccta actctgttct cactgattcg cgtaatattt
1028-1087	gtctcttcac cctcattttc tctggtgaaa gtgttggtgt gttgagtgaa gaaggaatcc
1088-1147	ccgctacaaa agctaactca tcattaacag atagtggaac aatcactggt tgtgatctaa
1148-1207	gctttatatg ctcctcctcg caccatgtta accattgtct gctctgtgat tcagataaga
1208-1267	aaatcagcat tttcactcgg tcaagaactg gtttcgctcg atcaaagtat tctcgtcgat
1268-1327	tctccattat ccaccaagct atttgacttc caccagctgg atgatgattc atgtattgat

FIG. 13

```
1328-1387  ctgcgagaaa aggaaaaaaa aaaagtaatt aagatatgct ttcctctgat tgtaaattag
1388-1447  tagtctaaaa actgcataat gaattcttac ctatccatga ggtacacact gctgatcctg
1448-1507  cgatgatcaa atctgctttc atggcagtct tgaagctgag ttctcctttg tcttcaacaa
1508-1567  ctttgatcct tctcctactg agctcttgca tcaatccacc tctcctgcta agaactactg
1568-1627  cagagactgt tgcaccacag ctcaaaagct ctgaagccag ctccatcata gaaattggag
1628-1687  caccagtcat tgatagctcg tggaaaagca ggacgaatct ccttgaccaa acaaggcgtt
1688-1747  taaaatctga tttcctgtcg caagtcccag atcttctatg cgggctccat tcaagaactt
1748-1807  tatcctctag tgatccaaag ggaccaagaa gcttaccata agtagcattt gtcaatggaa
1808-1867  gttgtggatc ttgctcatca tccaaatcct tagtctcaag tacctcttta atcaccttct
1868-1927  gcttaacacg gatcttacta cgagaagtcc ggacagtttt tctcgtcttc tgcttggaac
1928-1987  tcaagctccg tcgagaaacc ccatcatctt tcttgatcag actaacatcc gtcctcttat
1988-2047  tcgaaccagc atcatcttta ccagtaatat taaccaaagc ctcagaattc tcattagcaa
2048-2107  caacatccag tcctttaatc ttctccatat ataactcatc ctttctcggt ctgcctccaa
2108-2167  accgtaaaaa ctcaactttg ctttcattat catgtgccca cctagactga acataaaatc
2168-2227  caagatacgt ccaaagcgta atcaaaagca gccaataaac caaccggcta ctacgaaacc
2228-2287  actgaaacgc tcctcctcca ccatgacctc tacgcggagt cctaccagaa tacactctag
2288-2347  gtgtacccct tggagtagac ctccctgaca gtgaagactt aacacttgtc tgtctcagcg
2348-2369  gcgataaccg aatctcctcc at
```

FIG. 13 CONTINUED

SQD1

```
   1 gtcgacccac gcgtccgctc atctctcatc gttccgggag aagagaagag agacccatcc
  61 ctcacttcaa agttcaaagt ctcgaaggat cttctccaac tctctctaaa caagattcca
 121 aattttcaaa ggtgaatttg tttgatagaa tcaagaacaa acctttaaat gtgcgcatct
 181 actttcagct tcatgccctt cagttatctc acttagcagc agcagcagca agaattcagt
 241 taagccgttt gtttcagggc agaccttctt caatgctcag cttctttcaa gatcttctct
 301 caaaggactt ctcttccaag agaagaaacc gagaaaaagc tgcgttttca gagcaactgc
 361 tgtacctata acccaacaag caccacccga aacatctacc aataactcat cctctaaacc
 421 aaagcgtgtt atggtcattg gtggagatgg ttattgcggt tgggctactg ctctccactt
 481 gtccaagaag aattacgaag tttgcattgt tgacaacctt gtaagacgtc ttttcgacca
 541 ccagcttgga cttgagtcat tgactcctat tgcctccatt catgaccgaa tcagccgatg
 601 gaaggctttg acagggaaat caattgagtt gtacgttggt gatatctgtg atttcgaatt
 661 cttagctgag tctttcaagt cttttgagcc ggattcagtt gtccactttg gggaacagag
 721 atccgctcct tactcgatga ttgaccggtc cagagcagtt tatacacagc acaacaatgt
 781 gattgggact ctcaacgttc tctttgctat aaaagagttt ggagaggagt gtcatcttgt
 841 aaaacttggg acgatgggtg agtatggaac tccaaatatt gacatcgagg aaggttatat
 901 aaccataacc cacaacggta gaactgacac tttgccatac cccaagcaag ctagctcctt
 961 ttatcatctt agcaaagttc atgattcgca caacattgct tttacttgca aggcttgggg
1021 tattagagcc actgatctca accaaggagt tgtttatgga gtgaagactg atgagacaga
1081 gatgcatgag gaactccgta accgactgga ttacgatgct gtgtttggta cagcacttaa
1141 ccggttctgt gtgcaagctg ctgttggtca cccacttaca gtttatggta aaggtggtca
1201 gacgagaggc tacctcgata taagagacac ggttcaatgt gttgagatcg ctatagcaaa
1261 cccggcaaaa gctggtgagt tccgggtctt caaccaattt acagaacagt tttcagtcaa
1321 tgaactggct tcactcgtca ctaaagcggg ttcaaagctt gggctagacg tgaaaaagat
1381 gacggtgcct aacccgagag tggaggcaga agaacattac tacaacgcaa agcacactaa
```

FIG. 14

Appln No.: 09/709,020 Filed: 11/08/00
Inventors: Handique *et al.*
Attorney Docket No.: MSU-04769
Reply Dated Nov. 9, 2006
Notice Regarding Drawings Dated 10/05/06
Replacement Sheet Sheet 18 of 23

```
1441 gctgatggaa cttggacttg agcctcacta tctatctgac tcacttcttg attcgttgct
1501 caactttgct gttcagttta aagatcgtgt ggacacgaaa caaatcatgc ctagtgtttc
1561 ctggaagaag attggcgtca agactaagtc catgaccaca taaagtgcag accaatatta
1621 cacataagga gagattatga aagagatgat gtgttgtttg gtatcttcaa acttcatttc
1681 tgcaaaagac ttgctaggct taagaggttt tgtccatatt acattgtgca ggttctttaa
1741 tgttagatct taatttcgat gaaaaaaaaa aaaaaaaaaa aaaaaaaaag ggcggccgc
```

FIG. 14 CONTINUED

SQDB

```
1-25                                                gtgaa gattcttgta ttgggtggcg
26-85       atggtttctg cgggtggccc tgcgctctca atttggctgc tgcaggtcac gccgtcacca
86-145      ttgttgacaa cctcgttcgc cgcaagacag acgtggaatt gggggttcag tccctcactc
146-205     cgatcgcgac gattgaacgc cggttgaagg catggcaaga aacgggcggg cagccgatta
206-265     gctttgtcaa tctcgactta gcggctgatt acgatcgcct ctgtgcacta ctgctagaaa
266-325     cgcagccgga tgcgatcgtg cattttgccg aacagcgcgc cgcccctat tcaatgaaga
326-385     gtgcatggca taagcgcttc acggtcaata acaacgtcaa cgccacccac aatctgctct
386-445     gcgcctgtgt ggatgtcggc ctcaagtccc acattgtcca cttgggcacc atgggcgtct
446-505     atggatacgg tagccatcgc ggggctacga ttcctgaagg ctacttagaa gtggaagtcg
506-565     tccagcggga tggccaacgc tttgaagaga agattcttca ccccgttgat ccgggtagcg
566-625     tctatcacat gaccaagacg ctggatcaat tgttgttcta ctactacaac aagaacgaca
626-685     acatccaagt caccgacctt caccagggta ttgtctgggg cacgaacacc gatcactgta
686-745     atctccaccc ggatctgacc aatcggttcg actacgacgg tgattacggc acagtcttga
746-805     accgcttctt gatgcaggcg gcgatcggct atcccttgac tgtgcatggc gttggtggcc
806-865     aaacccgagc cttcatccac attcgcgact cagtgcgctg cgtccaactg gcgatcgaaa
866-925     atccgccagc agccaatgaa aaagtccgca tctttaacca gatgacggaa acctaccaag
926-985     tcaaggattt ggcagagaaa gtggcggcat tgaccggtgc tgaaatcgcc tacctgccca
986-1045    atccacgcaa ggaagcccct gagaacgact tgattgtcga caaccgctgc ttgattgatt
1046-1105   taggcctcaa tccgaccacc ttggacaatg gcctgatgag cgaagtggta gaaattgcgc
1106-1165   agaagtttgc cgatcgctgc gatcgcgcca aaattccctg cgtttctgcc tggacccgta
1166-1209   atcaagctga agctctcagc gctcctgaaa ccgctctgcg ctaa
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FIG. 15

Appln No.: 09/709,020 Filed: 11/08/00
Inventors: Handique *et al.*
Attorney Docket No.: MSU-04769
Reply Dated Nov. 9, 2006
Notice Regarding Drawings Dated 10/05/06
Replacement Sheet Sheet 20 of 23

MAHLLSASCPSVISLSSSSSKNSVKPFVSGQTFFNAQLLSRSSLKGLLFQEKKPRKSC
VFRATAVPITQQAPPETSTNNSSSKPKRVMVIGGDGYCGWATALHLSKKNYEVCIVDN
LVRRLFDHQLGLESLTPIASIHDRISRWKALTGKSIELYVGDICDFEFLAESFKSFEP
DSVVHFGEQRSAPYSMIDRSRAVYTQHNNVIGTLNVLFAIKEFGEECHLVKLGTMGEY
GTPNIDIEEGYITITHNGRTDTLPYPKQASSFYHLSKVHDSHNIAFTCKAWGIRATDL
NQGVVYGVKTDETEMHEELRNRLDYDAVEGTALNRFCVQAAVGHPLTVYGKGGQTRGY
LDIRDTVQCVEIAIANPAKAGEFRVFNQFTEQFSVNELASLVTKAGSKLGLDVKKMTV
PNPRVEAEEHYYNAKHTKLMELGLEPHYLSDSLLDSLLNFAVQFKDRVDTKQIMPSVS
WKKIGVKTKSMTT

FIG. 16

MRIALFTETFLPKVDGIVTRLRHTVDHLQRLGHTVMVFCPDGGLREHKGARVYGVKGF
PLPLYPELKLAFPLPKVGKALERFRPDLIHVVNPAVLGLGGIYYAKALNVPLVASYHT
HLPKYLEHYGLGVLEGVLWELLKLAHNQAAINLCTSTAMVQELTDHGIEHCCLWQRGV
DTETFRPDLATAAMRDRLSGGKPTAPLLLYVGRLSAEKQIDRLRPILDANPEACLALV
GDGPHRAELEQLFAGTQTQFIGYLHGEQLGAAYASADAFVFPSRTETLGLVLLEAMAA
GCPVVAANSGGIPDIVSDGINGFLFDPEDEQGAIAAIQRLLANPAEREILRQAARQEA
ERWSWNAATRQLQDYYCEVLADGCLPLAA

FIG. 17

Appln No.: 09/709,020 Filed: 11/08/00
Inventors: Handique *et al.*
Attorney Docket No.: MSU-04769
Reply Dated Nov. 9, 2006
Notice Regarding Drawings Dated 10/05/06
Replacement Sheet Sheet 22 of 23

MKILVLGGDGFCGWPCALNLAAAGHAVTIVDNLVRRKTDVELGVQSLTPIATIERRLK
AWQETGGQPISFVNLDLAADYDRLCALLLETQPDAIVHFAEQRAAPYSMKSAWHKRFT
VNNNVNATHNLLCACVDVGLKSHIVHLGTMGVYGYGSHRGATIPEGYLEVEVVQRDGQ
RFEEKILHPVDPGSVYHMTKTLDQLLFYYYNKNDNIQVTDLHQGIVWGTNTDHCNLHP
DLTNRFDYDGDYGTVLNRFLMQAAIGYPLTVHGVGGQTRAFIHIRDSVRCVQLAIENP
PAANEKVRIFNQMTETYQVKDLAEKVAALTGAEIAYLPNPRKEALENDLIVDNRCLID
LGLNPTTLDNGLMSEVVEIAQKFADRCDRAKIPCVSAWTRNQAEALSAPETALR

FIG. 18

Appln No.: 09/709,020 Filed: 11/08/00
Inventors: Handique *et al.*
Attorney Docket No.: MSU-04769
Reply Dated Nov. 9, 2006
Notice Regarding Drawings Dated 10/05/06
Replacement Sheet Sheet 23 of 23